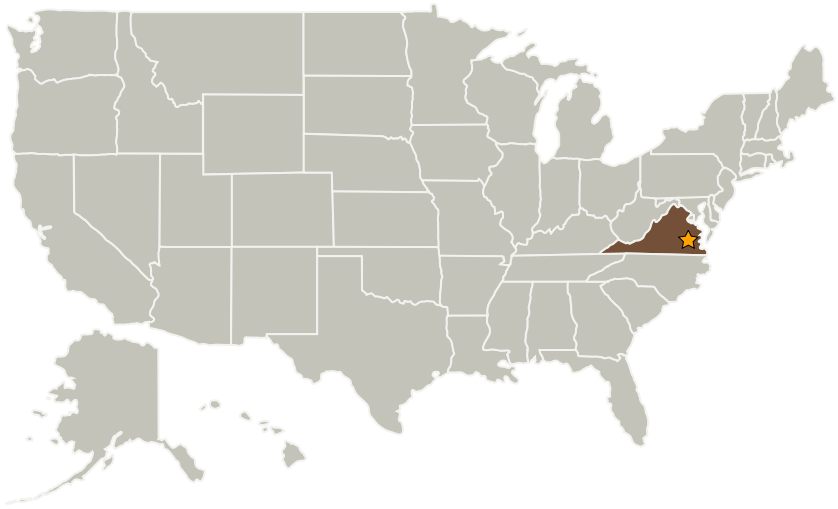
Optimal Rendezvous and Docking Simulator for Elliptical Orbits, Phase I

Completed Technology Project (2006 - 2006)

Project Introduction

It is proposed to develop and implement a simulation of spacecraft rendezvous and docking guidance, navigation, and control in elliptical orbit. The foundation of the simulation will be an extension of an existing tool for optimal rendezvous and docking simulations for spacecraft in circular orbit. The existing tool architecture functions in two phases. In the first phase, optimal trajectories are obtained for the point mass model of the docking vehicle subject to path constraints, with the assumption that the target vehicle is in a known, circular orbit. In the second phase of the simulation, the vehicle is considered as a rigid body whose attitude and trajectory is controlled such that the docking port is aligned with the target vehicle at the time of docking, and the flight path follows the optimal trajectory. It is proposed to extend the first phase trajectory optimization capability of this tool to the case when the target vehicle is in an elliptical orbit, and to also add the capability to model rendezvous navigation sensors in order to make use of estimated state feedback rather than true state feedback during the second phase of the simulation.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
Analytical Mechanics Associates, Inc.	Supporting Organization	Industry	Hampton, Virginia

Primary U.S. Work Locations
Virginia

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX17 Guidance, Navigation, and Control (GN&C)
  - TX17.2 Navigation Technologies
    - TX17.2.1 Onboard Navigation Algorithms